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(54) Improvements in or relating to article tagging

(57) A tagging material comprises a substrate in the form of a film 101 of monoaxially oriented polypropylene coated on one surface with a layer 102 of polysiloxane release agent and on the other surface with a primer layer 103 of cross-linked natural crepe rubber. The primer layer 103 is coated with a layer 104 of pressure sensitive adhesive composition, comprising a mixture of natural crepe rubber and tackifying resin. A centrally located amorphous wire 105 is adhered to the pressure sensitive adhesive composition and is covered with a layer 106 of polyethylene leaving a free adhesive surface at either side which is sufficient to enable the tagging material to be self-wound by a reel (with adjacent convolutions adhered together by the adhesive) and to enable tags formed from the tagging material to be adhered to the article to be tagged.

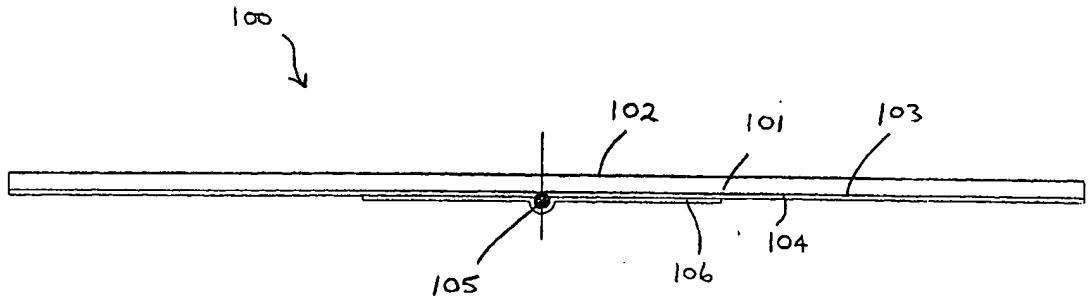

FIG. 1

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Description

[0001] This invention relates to article tagging and more particularly is concerned with applying tags to articles whereby their presence can be detected by electronic article surveillance techniques.

[0002] It is known for retail stores to provide certain of their articles for sale with tags formed of electromagnetic sensor material which can be detected by detection equipment. Ordinarily, at the point of sale, the cashier removes the tag from the article. Alternatively, the cashier deactivates the tag or bypasses the detection equipment. If, however, a thief attempts to avoid the cashier with the intention of stealing the article, he must necessarily pass the detection equipment which detects the presence of the tag and sounds an alarm. Hitherto, the tags have generally been applied, at the store, either manually or using a hand operated applicator of the type used to apply pressure sensitive adhesive labels. Such applicators are used in conjunction with a carrier tape in the form of a siliconised release paper or liner carrying detectable devices which are transferred from the carrier tape to the articles by the applicator. Thus is particularly time-consuming and expensive. Thus, only those articles which are of particularly high value such as clothes, compact discs, videos, perfumes, books and spirits tend to be tagged. However, the tags are usually fairly conspicuous and hence can be removed by the thief.

[0003] Attempts have been made to provide the articles with tags at source i.e. during the production of the article or during the production of the packaging for the article or at a time when the article is being packaged. These attempts have essentially involved motorising a pressure sensitive adhesive labeller of the above type. However such a system is still expensive because of the need to separate the detectable devices from the carrier tape, wind up the carrier tape from which the detectable devices have been removed, and apply the devices to the articles. Further, the system could, at best, apply 3 or 4 devices per second and hence the article production line or article packaging line had to be slowed down with attendant cost disadvantages.

[0004] In our European Patent Application No. 0673007 there is described and claimed a tagging material and a method and means of applying a tag formed from the tagging material to an article. The tagging material is in the form of a pressure sensitive adhesive tape having a first surface coated with pressure sensitive adhesive composition and a second surface opposite to the first surface coated with release agent, the tape including a continuous substrate of synthetic plastics material and a continuous electromagnetic sensor material capable of being detected by detection equipment. In an embodiment, the electromagnetic sensor material is in the form of a ribbon of the material adhered to the substrate by the pressure sensitive adhesive composition. In this case, the width of the ribbon is less than the width of the pressure sensitive adhesive composition so that the composition which is not covered by the sensor material is available for bonding to the article to be tagged. It has been found that, in some circumstances, the amount of pressure sensitive adhesive composition not covered by the sensor material is such as to cause difficulties when applying the tagging material. More particularly, in the case where the tagging material is applied to the article to be tagged by an applicator means including a transport belt, there may be a tendency for the tagging material to become adhered to the transport belt and be carried around with it. This is particularly likely in the case where the sensor material is in the form of a wire of circular cross-section or of elliptical cross-section and is relatively narrow compared to the width of the layer of pressure sensitive adhesive composition. Such a problem may also occur when the tagging material has low stiffness or rigidity.

[0005] It is an object of the present invention to provide a tagging material which is less susceptible to this problem.

[0006] In accordance with the present invention there is provided a tagging material for the production of a tag for securing to an article to enable the presence of the article to be detected, which tagging material is in the form of a pressure sensitive adhesive tape having a first surface coated with pressure sensitive adhesive composition and a second surface opposite the first surface coated with release agent wherein the tape includes a continuous substrate of synthetic plastics material and a continuous electromagnetic sensor material capable of being detected by detection equipment adhered to the substrate by the pressure sensitive adhesive composition, a part of the pressure sensitive adhesive composition which is not covered by the sensor material being treated to reduce its adhesive properties.

[0007] In a particularly preferred embodiment said part of the pressure sensitive adhesive composition is covered with a layer of synthetic plastics material in order to eliminate its adhesive properties. In this case it is preferred for the covering layer to be superposed on the sensor material so that the sensor material is fully encapsulated by the covering layer. The covering layer of synthetic plastics material may, for example, be a polyolefin film such as polyethylene or polypropylene or other flexible film of thermoplastic plastics material. The layer may have a thickness of, for example, from 15 to 60μ and may have a width of about 1/3rd of the width of the layer of pressure sensitive adhesive composition. As a result of the presence of this covering layer of synthetic plastics material, that surface of the tagging material which is to be adhered to the article includes an adhesive free zone i.e. a so called "dry channel". Hence the tagging material is less likely to adhere to, and wrap around, the transport belt. Further, the presence of the covering layer also increases the rigidity/stiffness of the tagging material and permits the tagging material to be applied at higher speed. Moreover, the presence of the

covering layer over the sensor material assists in retaining the sensor material in position on the substrate. This is particularly useful when the sensor material is in the form of a circular-sectioned wire or narrow ribbon since there is ordinarily insufficient surface contact between such sensor materials and the adhesive to ensure that the sensor material doesn't move with respect to the remainder of the tagging material.

[0008] A further consequence of the presence of the covering layer is that it enables wider tagging material to be used and more stable winding to be achieved. Indeed, improved results can be obtained by suitably selecting the width and thickness of the tagging material, (which largely determines the stiffness/rigidity), the adhesive composition, and the application speed.

[0009] The electromagnetic sensor material may be in the form of a ribbon or wire having a high magnetic permeability and low coercivity such as Permalloy metal and certain amorphous alloys of iron, nickel or cobalt which, when exposed to a continuous alternating magnetic interrogation field, is driven successively into and out of magnetic saturation by the alternating magnetic interrogation field. This results in a disturbance of the interrogation field such that other magnetic fields are produced at frequencies harmonically related to the interrogation field. The signal represented by these other fields can then be detected. It is particularly preferred for the sensor material to be such that it can be activated so that it reacts in the above way when subjected to such an alternating magnetic interrogation field and then be subsequently deactivated so as not to react in that way. Switchable materials of this type are well known in the art and are described in, for example, US patents No. 5,029,291, No.5,121,103, No.5,206,626, No.5,304,983 and No.5,126,270 and also in an article by K H Shin, C D Graham Jr. and P Y Zhou entitled Asymmetric Hysteresis Loops in Cobalt-based Ferromagnetic Alloys at page 2772 of IEEE Transactions on Magnetics, September 1992 (all of which are incorporated herein by reference).

[0010] In an alternative embodiment, the electromagnetic sensor material may be of the type incorporating thin film technology. For example, the sensor material may comprise a thin continuous metal film and a perforate metal film adhered to either side of a film of synthetic plastics material. The perforate metal film is then laminated to one face of the substrate, the release agent is coated on the opposite face of the substrate and the pressure sensitive adhesive composition is coated on the continuous metal film. Such materials are, for example, marketed by Esselte Meto. As in the previous embodiment, the electromagnetic sensor material includes Permalloy or amorphous metal alloys.

[0011] The substrate of the pressure sensitive adhesive tape will ordinarily be in the form of a thin base film of synthetic plastics material having a thickness of, for example, from 30 to 60 microns and a width of from 2 to 10 mm and preferably not less than 4 mm. The plastics material of the base film is generally oriented either monoaxially or biaxially and any thermoplastic plastics material may be used for the base film provided that it has adequate strength and dimensional stability. Preferably, the base film is formed of monoaxially oriented polypropylene or polyester.

[0012] Any suitable pressure sensitive adhesive composition may be used. Thus, it may, for example, be based on natural or synthetic rubber or on acrylic copolymers. Preferably the adhesive is a natural rubber resin solvent based system although aqueous or solvent based acrylic copolymers can be used.

[0013] Normally a primer coating is provided between the pressure sensitive adhesive composition and the surface of the base film so as to promote anchorage of the pressure sensitive adhesive composition. That surface of the base film which is not coated with the pressure sensitive composition is generally coated with a release agent such as a silicone release lacquer.

[0014] The tagging material may be produced by coating one of the surfaces of a web of the base film material with the pressure sensitive adhesive composition and the other of its surfaces with the release agent. The coated web is then slit longitudinally into wide strips in a first cutting stage and the strips are then slit longitudinally into narrow tapes in a second cutting stage. A plurality of spaced apart cutting edges is used at each cutting stage. Lengths of the electromagnetic sensor material are fed to each of the wide strips as it is being cut at the second cutting stage so that a length of sensor material passes between each pair of adjacent cutting edges and is then effectively adhered to the resultant tapes by means of the pressure sensitive adhesive composition of the tapes. A narrow film of synthetic plastics material is then applied over the sensor material and the pressure sensitive material adjacent thereto in a manner such that sufficient adhesive surface is available to enable the tape to be wound up onto a reel in which adjacent convolutions are adhered together by the adhesive and subsequently to be adhered to the article.

[0015] The tagging material can be traverse wound onto a reel in lengths of from 1,000 to 50,000 linear metres, preferably 25,000 metres. The material can be self-wound in that there is no need to include a release paper when winding the material onto a reel.

[0016] The tagging material can be used to form a tag on an article in the manner described in our European Patent Application No. 0673007 (incorporated herein by reference). Thus, the article is caused to move along an article path, the tagging material is moved along a tagging material path converging with the article path, a predetermined length is severed from the tagging material to form a tag, and the tag is adhered to the article by means of the pressure sensitive adhesive composition which has not been covered with the layer of synthetic plastics material.

[0017] The article to which the tag is applied may be the product itself in which case the tag is directly applied

to the product or the article may be packaging for the product in which case the article is applied to, or incorporated in, the packaging material.In any event, it is preferable that the tag is located such that it is not readily visible since otherwise it could be removed by the thief prior to reaching the point of sale. Thus, for example, the tag may be applied directly to the product and then be covered over by a label so that the tag cannot be seen. Alternatively, the tag can be applied to the back of the label before the label is applied to the product. In alternative embodiments, the tag may be incorporated in a carton in which the product is to be packaged for example in the side seam or the crash lock of the carton or the tag may be sandwiched between the two sheets which are normally laminated together to form the base board of blister packs.

[0018] In the case where the article to which the tag is to be applied is a discrete article, then a plurality of the articles may be moved along the article path so that each article receives a tag. Alternatively, if the article is a continuous web of packaging material, then a plurality of tags will be applied to the moving web at locations which are predetermined so that they are not impaired during subsequent cutting or folding operations.

[0019] In this way, it is possible to apply tags to products as they are being produced in the production line or as they are being packaged in the packaging line at a rate of up to 20 tags per second. Thus the production line or packaging line can continue to operate at high speed.

[0020] Generally, the tag will be in its deactivated form when applied to the article at source during product manufacture or packaging. Then, a plurality of such tagged articles may be placed on a pallet for transfer to the retail store. All the tags can then be bulk activated simultaneously as they are being supplied into the warehouses of the retail store having the necessary detection equipment so that the articles in the store are activated. Then, at the point of sale, the tag is deactivated so that it will not actuate the detection equipment located between the point of sale and the exit.

[0021] A tag may be formed from the tagging material and applied to the article using the means described in our European Patent Application No. 0673007 (incorporated herein by reference). Thus the applying means may comprise a means for feeding the tagging material to an applicator head and a means of feeding an article to said applicator head, wherein said applicator head comprises a detector for detecting the position of an article at the head; a means of severing, from the tagging material, a predetermined length to form a tag; and means for adhering the tag to the article by means of the pressure sensitive adhesive composition of the tag.

[0022] In a preferred embodiment, the means for feeding the tagging material to the applicator head may be a dispenser of the type described in our European patent No. 0121371 for applying pressure sensitive adhesive tear tape to filmic packaging material (incorporated herein by reference).

[0023] The applicator head may comprise a means for feeding the tagging material towards a tag-applying roller which, when the article to be tagged is sensed to be in an appropriate position, causes an incremental encoder to actuate the tagging material feed means to such an extent that a predetermined and controlled length of the tagging material is fed towards the tag-applying roller and is then severed from the remainder of the tagging material to form the tag. As the tag is cut from the tagging material, it is applied to the article by being passed between the article and the tag-applying roller.

[0024] The severing means may be in the form of a guillotine or, more preferably, in the form of a rotary cutter including one or more cutting edges.

[0025] The tagging material feed means may be in the form of a pair of feed rollers. Preferably, however, the tagging material feed means includes a transport belt co-operating with a shoe or with another transport belt. In this case, the means of severing the tag from the tagging material is preferably a rotary cutter which may be linked to the transport belt so as to operate at the same speed or which may be driven by a separate motor controlled by an incremental encoder so that the length of tag cut from the tagging material can be varied. By utilising a tagging material in accordance with the present invention, any tendency for the tagging material to wrap around the end of the transport belt is minimised.

[0026] In the case where the applicator head includes tagging material feed rollers, the applicator head may include a chamber through which the tagging material passes and positioned between the feed rollers and the tag-applying roller. A current of air is blown through the chamber so as to control the position of the free end of the tagging material after the tag has been cut from it.

The following Example illustrates the invention

EXAMPLE

[0027] A web of monoaxially oriented polypropylene film having a thickness of about 40 μm was formed in conventional manner. One surface of the web was then coated with a release agent comprising 100 parts of Silcolease 425 (a 30% solids concentration of dimethyl polysiloxane and methyl hydrogen polysiloxane resins in toluene from Rhone Poulenc) together with 4 parts of Catalyst 62A and 4 parts of Catalyst 62B (50% solids concentration of aminoalkoxy-polysiloxane in toluene and alkyl tin acrylate in xylene, respectively from Rhone Poulenc). It was applied to give a dry coating weight of 0.25 g/m^2.

[0028] The other surface of the web was then coated with a primer and a transparent pressure sensitive adhesive composition. The primer was a solution in toluene of 25 parts of natural crepe rubber and 8 parts of a cross-linking agent (Vulcabond TX) to give a coating

weight of 0.25 gms per square metre. Vulcabond TX is manufactured by ICI and is a 50% solution of polyisocyanate (mainly diphenyl methane di-isocyanate) in xylene. The pressure sensitive adhesive composition was a solution of 100 parts natural crepe rubber, 110 parts of a tackifying resin having a melting point of 110/115°C (Arkon P) and one part of an oxidant (Irganox) dissolved in a hydrocarbon mixture (SBP2). This was applied by a conventional reverse role coating technique to give a dry coating weight of 15 to 40 g/m^2. Arkon P is marketed by Arakara Chemicals and is a fully saturated cyclic hydrocarbon resin and Irganox is marketed by Ciba-Geigy and is a high molecular weight bonded polyphenol.

[0029] The thus coated web was then slit longitudinally into strips and each strip was then slit longitudinally so as to provide a plurality of pressure sensitive tapes of width 6 mm.

[0030] Amorphous circular section wires of $Co_{70.5}Fe_{4.5}Si_{10}B_{15}$ alloy were prepared by melt spinning in air followed by annealing for about 20 hours at a temperature of 380°C in an applied magnetic field of about 0.3 Oersteds directed parallel to the wire axis. As a consequence, an antiferromagnetic film was formed on the alloy substrate which was magnetically exchange coupled with the substrate. The resultant wires exhibited asymmetrical hysteresis characteristics and responded to applied interrogation fields by producing narrow high amplitude pulses which were easily detectable.

[0031] The wires were adhered to the middle of the adhesive coated surfaces of the tapes as they were being formed from the strips and a polyethylene film of width 2 mm and thickness 26 μ was then placed over the wire leaving a 2 mm wide strip of adhesive at either side. The resultant tagging material was then traverse wound onto cores to provide reels carrying continuous lengths of tagging material of about 25,000 metres long.

[0032] The tagging material was subsequently fed from the reel along a path converging with the path of a plurality of moving articles and tags were cut from the tagging material and adhered to the articles by the adhesive by the method described with reference to the accompanying drawings.

[0033] For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings in which:-

Figure 1 is a schematic cross-section through one embodiment of a tagging material of the invention,

Figure 2 is a schematic cross-section through another embodiment of a tagging material of the invention,

Figure 3 is a schematic front elevation of a means of feeding the tagging material of the invention to an applicator head for cutting tags from the tagging material and applying the same to an article in the form of a label,

Figure 4 is a schematic front elevation of the feeding means shown in Figure 3, and

Figure 5 is a schematic front elevation of the applicator head for receiving tagging material from the feeding means of Figures 3 and 4, cutting tags from the tagging material, and applying the tags.

[0034] In the drawings corresponding parts are denoted by like reference numerals.

[0035] Referring to Figure 1, there is shown, in diagrammatic form, a cross-section through a continuous length of tagging material 100 as produced in the foregoing Example. The material comprises a substrate in the form of a film 101 of monoaxially oriented polypropylene coated on one surface with a layer 102 of polysiloxane release agent and on the other surface with a primer layer 103 of cross-linked natural crepe rubber. The primer layer 103 was then coated with a layer 104 of pressure sensitive adhesive composition comprising a mixture of natural crepe rubber and tackifying resin. Finally, a centrally located amorphous wire 105 of $Co_{70.5}Fe_{4.5}Si_{10}B_{15}$ alloy was adhered to the pressure sensitive adhesive composition and was covered with a layer 106 of polyethylene leaving a free adhesive surface at either side which was sufficient to enable the tagging material to be self-wound on a reel (with adjacent convolutions adhered together by the adhesive) and to enable tags formed from the tagging material to be adhered to the article to be tagged.

[0036] Referring to Figure 2, there is shown a cross-section through a continuous length of another tagging material according to the invention. The width of the substrate 101 is greater than in the case of Figure 1. The electromagnetic sensor material is in the form of a narrow ribbon 105 of generally elliptical section and the covering layer 106 is a polypropylene film having a width which constitutes about one quarter of the width of the substrate 101. As in Figure 1, the tagging material 100 can be self-wound onto reels in long lengths.

[0037] Referring to Figures 3 to 5 of the drawings, and particularly to Figures 3 and 4, there is shown a means 200 for feeding the tagging material to the applicator head of the apparatus. The means 200 comprises a frame 1 on which is mounted a reel 2 of tagging material according to the first aspect of the invention. The reel is rotatable about an axis 3 by a geared variable speed AC/DC motor 4, an electromagnetic clutch/brake mechanism 5, and a coupling 6 all mounted on the frame 1. (In the case where only small reels are being used, the geared motor 4 is unnecessary and the tagging material can merely be drawn off from the reel 2 without the reel being motorised). An accumulator arm 7 is mounted for pivotal movement on shaft 8 mounted for rotation on the frame 1. Three guide rollers 9 are provided at a first end of the arm and an adjustable balance weight 10 is provided at the second end of the arm. The second end of the arm is also secured to the frame 1 by means of a tension spring 11. The frame also carries a lower fixed arm 12 upon which are mounted three guide rollers 13.

The tagging material follows a zig-zag path 14 from the reel 2 around the guide rollers 9 and 13 and thence to the applicator head 19 (Figure 5). The tagging material is twisted through 180° about its longitudinal axis between each pair of adjacent guide rollers so that the pressure sensitive surface of the material does not come into contact with any of the guide rollers. Tension is imparted to the tagging material by resistance to downward movement of the arm 7. The adjustment of the tension is by appropriate positioning of the balance weight 10 on the arm. The arm 7 tends to move downwardly (shaft 8 rotating clockwise) in response to demand for tagging material from the applicator head 19. As the arm moves downwards, a sensing plate covers a first proximity switch 15 which switches on the motor 4. With further demand for tagging material from the applicator head, the arm 7 moves further downwardly so that the sensing plate activates a second proximity switch 16 which engages the clutch and releases the brake of mechanism 5. The reel is now able to be driven by the motor 4. The shaft 8 for the accumulator arm 7 carries a spur gear engaged with a pinion on the shaft of a potentiometer 17 and further downward motion of the arm 7 causes the potentiometer to increase the motor speed accordingly. When the demand from the applicator head decreases, the arm 7 moves upwardly and operates the proximity switch 16 which disengages the clutch and hence the drive from the motor 4 to the reel 2. This additionally has the effect of lengthening the path of the tagging material to accommodate the lack of demand for tagging material from the applicator head. Also because the clutch is disengaged, the speed of rotation of the reel 2 tends to decrease during this time. In this way, the tension in the tagging material is effectively reduced and the material is fed to the applicator head at a controlled predetermined tension.

[0038] The tagging material is fed by the feeding means to the applicator head shown in Figure 5. The applicator head comprises a frame 20 in the form of a back plate to which are secured modular sub-assemblies 64 and 66. The backplate 20 has guides 63 secured thereto to define the tagging material path 14.

[0039] The sub-assembly 64 includes a housing secured to the backplate by means of a plurality of screws 71. The housing has mounted therein a drive roller 72 (driven by a stepper motor not shown in the interests of clarity) and a cutter roller 73 having a cutting edge 73a and drivingly linked to drive roller 72 by a drive belt 74. (More than one cutting edge may be provided on cutter roller 73 if desired). Also mounted within the housing of sub-assembly 64 is a metal roller 23 which is harder than the cutting edge(s) of the cutter roller 73 and which co-operates therewith to cut the tagging material. Metal roller 23 also serves as the tag applying roller.

[0040] A cover plate 65 is secured to the housing 64 by screws 65a and holds the assembly of metal roller 23 and cutter roller 73 together. The roller 23 is mounted for rotation about a shaft terminating in an eccentrically mounted disc 23a rotatably located in the cover plate 65 and having a slot 23b. By inserting a screwdriver in slot 23b the disc 23a can be rotated whereby the roller 23 can be moved towards or away from the cutter roller 73. This is used when setting up the apparatus to ensure that the distance between the rollers 23 and 73 is correct and to compensate for cutter wear from time to time. The cover plate 65 carries a scale 65b whereby the amount of wear of the cutting edge(s) can be visually indicated.

[0041] The sub-assembly 66 includes a housing secured to the housing of sub-assembly 64 by screws 75. Within the housing of sub-assembly 64 is a transport belt 62 passing around roller 72 and guides 76. The transport belt 62 is made from silicone rubber material having good release properties with respect to the pressure sensitive adhesive composition of the tape and co-operates with a shoe in the form of top plate 33 formed from polytetrafluoroethylene to define the tagging material path through the applicator head. The shoe is secured in the housing by means of screws 77 passing through slotted holes 78 in the shoe so as to allow the shoe limited movement perpendicularly to the transport belt 62. A spring 32 is mounted on a peg 79 so as to resiliently urge the shoe towards the transport belt 62. In use, the tape passes through the applicator head with its non-adhesive surface adjacent to the shoe. (If desired the shoe may be replaced by a second transport belt similar to transport belt 62.) Because both drive belt 74 and transport belt 62 are driven by drive roller 72, the cutter roller 73 stops and starts as the tagging material feed means stops and starts. More particularly the feed rate of the tagging material and the time of the cutting action are fixed relative to one another and the length of the tag cut from the tagging material is dependent on the radius of the cutter roller 73 and the number of cutting edges on the cutter roller 73.

[0042] The apparatus includes a hopper (not shown) to receive a stack of labels and feed them individually to a conveyor belt 51 running at line speed. The belt 51 carries the labels past the applicator head and then to label stacker (not shown). More particularly, a plurality of labels 29, face down, is caused to move in succession along an article path defined by belt 51. The applicator head includes a bracket 80 attached to the backplate 20 and a rubber coated wheel 60 is mounted for rotation on the bracket 80 in a location where it contacts the surface of the label 29 passing along the article path 51. The coated wheel 60 detects the speed at which a label is passing along the path 51 and causes an appropriate signal to be transmitted to the motor driving the roller 72. This signal, in combination with a signal from the photoelectric proximity sensor 31, ensures that at the appropriate time, tagging material is fed through the applicator head and a tag is cut therefrom by the cutter roller 73 whereby, when the label 29 reaches metal roller 23, the tag is in position ready to be adhered to the label 29 as the tag and label 29 pass between the metal roller

23 and an underlying roller. The underlying roller may be a part of the line to which the apparatus is fitted.

[0043] If desired, the signal related to the speed of the label may be generated from elsewhere (for example from a production line or packaging line to which the tag applying means is fitted).

[0044] In use, tagging material from a tagging material feeding means (such as described in Figures 3 and 4) is fed into the applicator head along path 14. More particularly the tagging material passes around guides 63 and enters the nip between the shoe 33 and the transport belt 62 with its adhesive side adjacent the belt 62. The free end of the tagging material is ordinarily adjacent the nip of cutter roller 73 and metal roller 23 as a consequence of a previous tag-applying cycle. The presence and speed of a label 29 passing along path 51 are detected by the coated wheel 60. The drive motor for drive roller 72 is then appropriately actuated to accelerate the transport belt 62 so as to feed tagging material through the nip between cutter roller 73 and metal roller 23 and cut off a tag therefrom so that the tag is ready for application to the label 29 as it passes under metal roller 23.

[0045] Because of the presence of the covering layer 106 on the tagging material, the tendency of the tagging material to adhere too strongly to the transport belt 62 (and hence became wrapped around the end of the belt) is reduced.

[0046] By making use of a rotary cutter as in this embodiment, speeds of the order of 1000 tags per minute can be readily achieved. The use of a transport belt as the tagging material feed means has the advantage that it provides a self-feeding facility for introducing the tagging material into the applicator head and thence to the vicinity of metal roller 23 and cutter roller 73.

[0047] If it is desired to change the length of the tag cut from the tagging material, this can be done by replacing the cutter roller 73 with another cutter roller of a different diameter or with a cutter roller having a different number of cutting edges. Alternatively, however the facility to vary the length of the tag can be achieved by providing a separate stepper motor to drive the cutter roller 73 instead of mechanically linking the speed of the cutter roller 73 to the speed at which the tagging material is fed through the applicator head. In this way the cutter roller 73 can be accelerated from its rest position to a position at which its cutting edge severs a tag of desired length from the tagging material, the cut length being a function of the rotation of the cutter roller 73 and the feed speed of the tagging material through the applicator head.

Claims

1. A tagging material for the production of a tag for securing to an article to enable the presence of the article to be detected, which tagging material is in the form of a pressure sensitive adhesive tape having a first surface coated with pressure sensitive adhesive composition and a second surface opposite the first surface coated with release agent wherein the tape includes a continuous substrate of synthetic plastics material and a continuous electromagnetic sensor material capable of being detected by detection equipment adhered to the substrate by the pressure sensitive adhesive composition, a part of the pressure sensitive adhesive composition which is not covered by the sensor material being treated to reduce its adhesive properties.

2. A tagging material according to claim 1 wherein said part of the pressure sensitive adhesive composition is covered with a layer of synthetic plastics material.

3. A tagging material according to claim 2 wherein the covering layer is superposed on the sensor material so that the sensor material is fully encapsulated by the covering layer.

4. A tagging material according to claim 2 or claim 3 wherein the covering layer of synthetic plastics material is a flexible film of thermoplastic plastics material.

5. A tagging material according to any of claims 2 to 4 wherein the covering layer has a thickness of between 15 and 60 μm and a width of approximately $^1/_3$ of the width of the layer of the pressure sensitive adhesive composition.

6. A tagging material according to any of claims 1 to 5 wherein the electromagnetic sensor material is in the form of a ribbon or wire having a high magnetic permeability and low coercivity which, when exposed to a continuous alternating magnetic interrogation field, is driven successively into and out of magnetic saturation by the alternating magnetic interrogation field.

7. A tagging material according to claim 6 wherein the sensor material is a switchable material which is capable of being activated so that it may be driven into and out of magnetic saturation and is capable of being deactivated so that it may not be so driven.

8. A tagging material according to any of claims 1 to 7 wherein the sensor material incorporates thin film technology.

9. A tagging material according to claim 8 wherein the sensor material comprises a thin continuous metal film, and a perforate metal film, one being adhered to either side of a film of synthetic plastics material.

10. Tag-applying means for applying a tag to an article,

the tag being formed from tagging material according to any of the preceding claims, the applying means comprising means for feeding the tagging material to an applicator head and means for feeding an article to said applicator head, wherein said applicator head comprises a detector for detecting the position of an article at the head, a means of severing, from the tagging material, a predetermined length to form a tag, and means for adhering the tag to the article by means of the pressure sensitive adhesive composition of the tag.

11. Tag-applying means according to claim 10 wherein the applicator head comprises a means for feeding the tagging material towards a tag-applying roller which, when the article to be tagged is sensed to be in an appropriate position, causes an incremental encoder to actuate the tagging material feed means to such an extent that a predetermined and controlled length of the tagging material is fed towards the tag applying roller and is then severed from the remainder of the tagging material to form the tag.

12. Tag-applying means according to claim 11 wherein the severing means is in the form of a guillotine or rotary cutter.

13. Tag-applying means according to claim 10 or claim 11 wherein the tagging material feed means is in the form of a pair of feed rollers.

14. Tag-applying means according to claim 13 wherein the applicator head includes a chamber through which the tagging material passes and which is positioned between the feed rollers and the tag-applying roller.

15. Tag-applying means according to any of claims 10 to 14 wherein the tagging material feed means includes a transport belt co-operating with a shoe or with another transport belt.

16. Tag-applying means according to claim 15 wherein the means of severing the tag from the tagging material is a rotary cutter which is linked to the transport belt so as to operate at the same speed as the transport belt.

17. A method of providing an article with a means of enabling the presence of the article to be detected, which method comprises the steps of i) providing a tagging material as claimed in any of claims 1 to 9 ii) causing an article to move along an article path iii) moving the tagging material along a tagging material path converging with the article path iv) severing a predetermined length from the tagging material to form a tag, and v) adhering the tag to the article by means of the pressure sensitive adhesive composition.

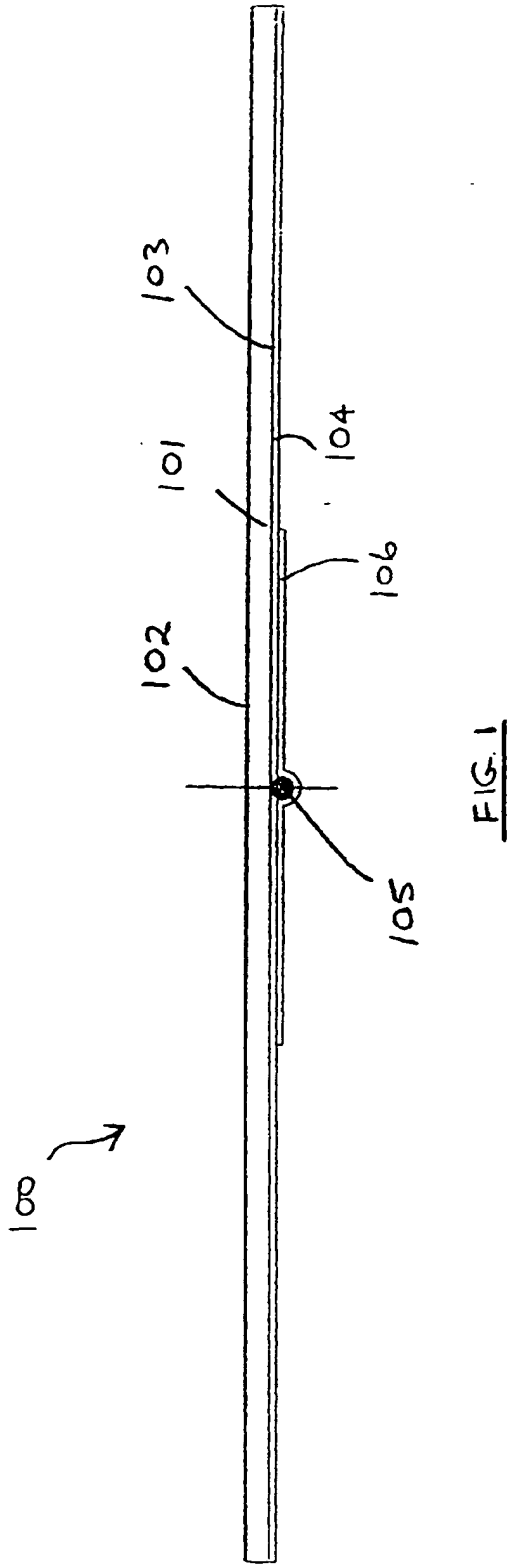


FIG. 1

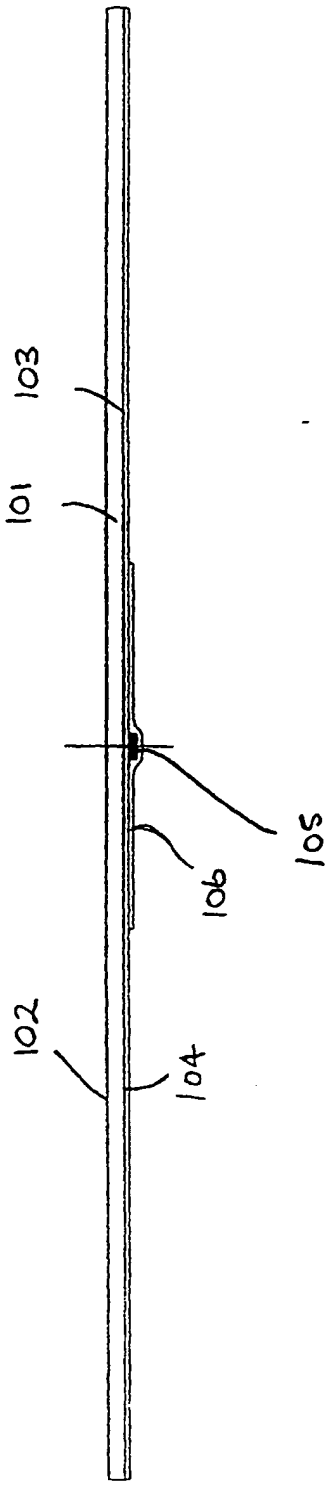


FIG 2

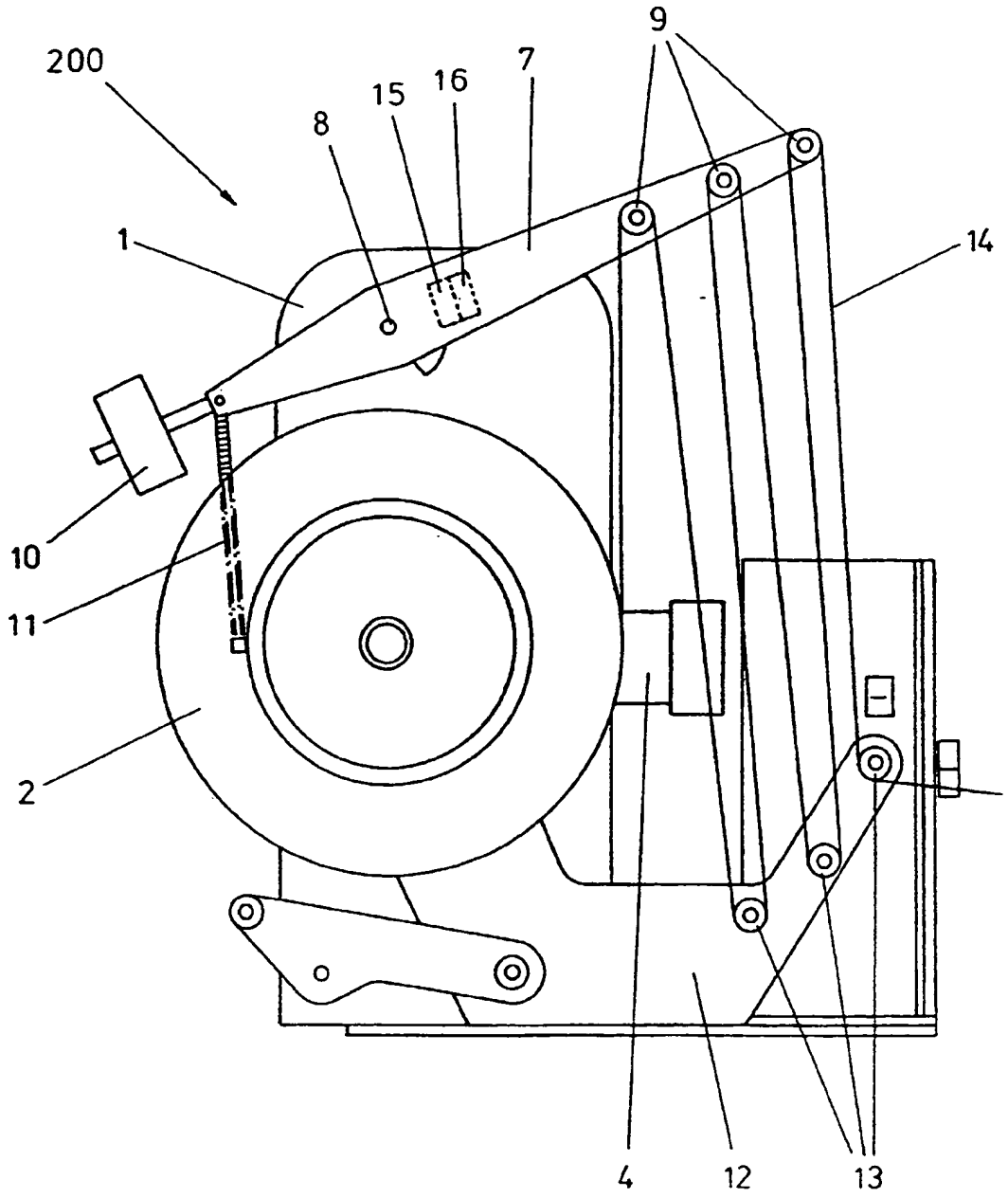


FIG. 4

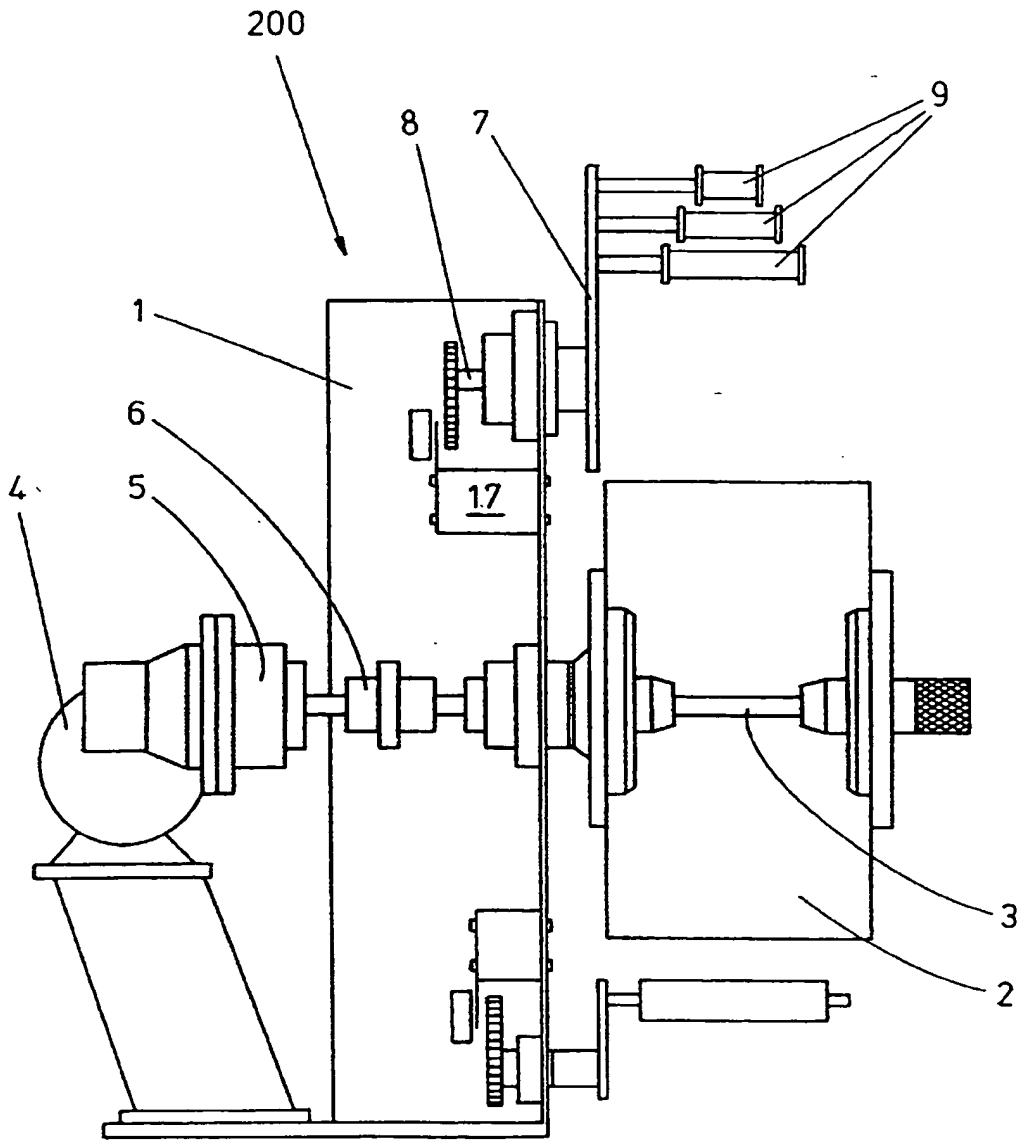
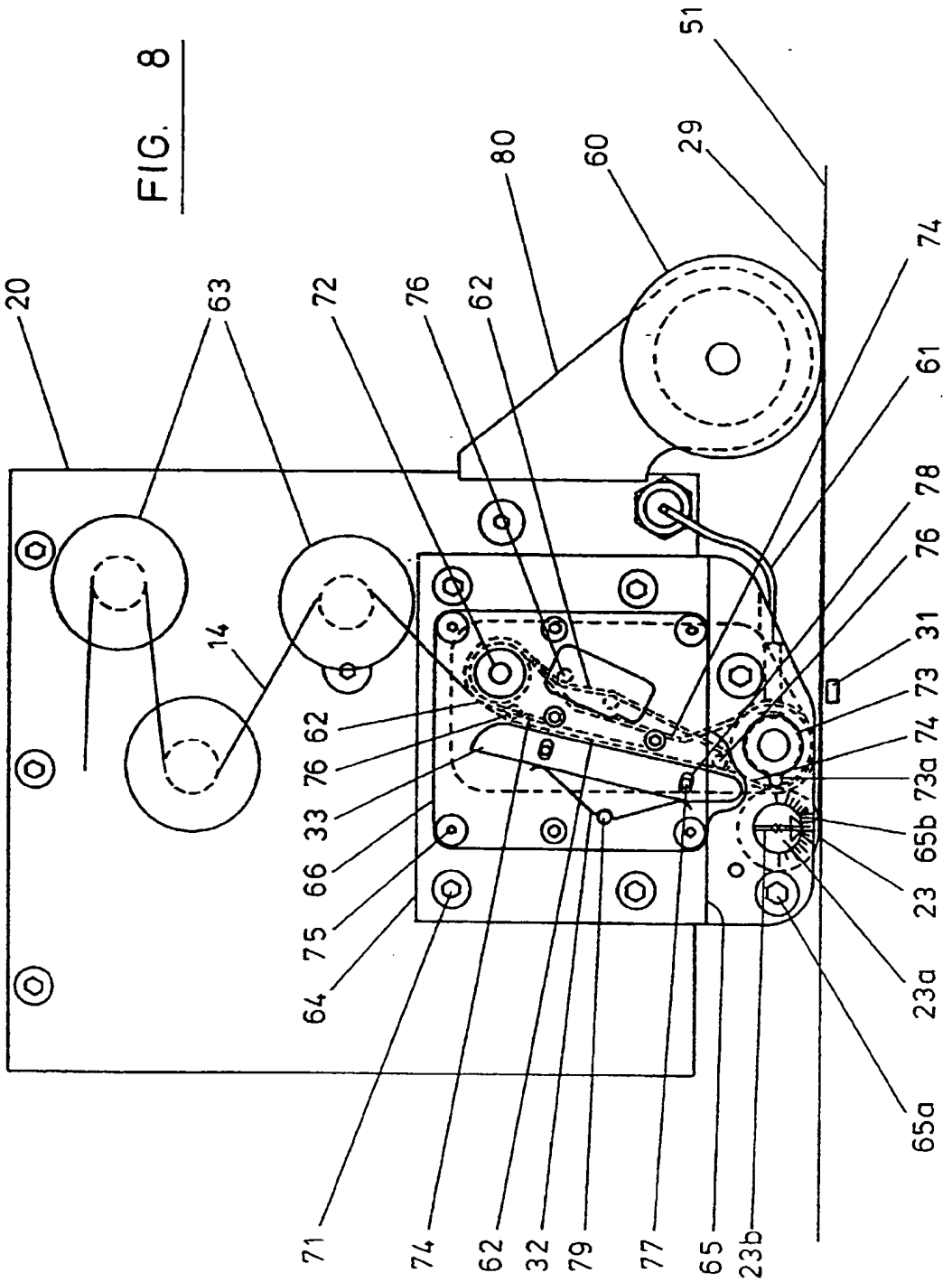


FIG. 5

FIG. 8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